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Pseudoplectania lignicola sp. nov. described from central Europe

S. Glejdura[1]*, V. Kučera[2], P. Lizoň[2], & V. Kunca[1]

[1]*Faculty of Ecology and Environmental Sciences, Technical University in Zvolen, T. G. Masaryka 24, Zvolen 960 53, Slovakia*

[2]*Institute of Botany, Slovak Academy of Sciences, Dúbravská cesta 9, Bratislava 845 23, Slovakia*

* Correspondence to: *glejdura@gmail.com*

Abstract — A new species from Slovakia and the Czech Republic, *Pseudoplectania lignicola,* is described and illustrated. It is distinguished from other members of the genus by a centrally arranged globose membranous sheath surrounding the spores, thick ectal excipulum of oblong cells at the apothecial base, and growth on less specific biotopes. Comparisons with similar species and the diagnostic significance of membranous sheath surrounding the ascospores are also discussed.

Keywords — biodiversity, *Sarcosomataceae*, typification

Introduction

The genus *Pseudoplectania* was established by Fuckel (1870) for two fungi, *Peziza nigrella* Pers. and *Peziza fulgens* Pers. *Pseudoplectania nigrella* was selected by Seaver (1913) as the lectotype of the genus, and the species itself was neotypified by Carbone & Agnello (2012). *Peziza fulgens* is today treated in the genus *Caloscypha* Boud.

Eleven species are currently accepted in the genus: *Pseudoplectania affinis*, *P. carranzae*, *P. ericae*, *P. kumaonensis*, *P. melaena, P. nigrella*, *P. ryvardenii*, *P. sphagnophila*, *P. stygia*, *P. tasmanica*, and *P. vogesiaca* (Carbone et al. 2013, 2014; Iturriaga et al. 2012).

The first finding of the new *Pseudoplectania* reported here was associated with *Leucobryum glaucum* and tentatively identified in situ as *P. sphagnophila.* The new fungus was later collected on *Abies alba* wood buried in soil as well as among *Sphagnum* bogs. The species was mostly collected on conifer wood.

Materials & methods

The study is based on the morphological examination of 11 collections from three localities in Slovakia and one in the Czech Republic. The macro-morphological characters were observed in fresh material. The micro-morphological structures were studied in fresh and dried material using a light microscope with oil immersion lens (×1000). Vertical sections of material were examined in 5% KOH, tap-water, Melzer's reagent, and a Congo Red + ammonia solution. Values of micro-morphological characters were estimated as average plus and minus a standard deviation of 30 measurements for each taxon (with 10 and 90 percentiles presented in parentheses). All descriptions are based on studied specimens. Localities are georeferenced and the coordinates are in WGS 84 system. Examined specimens are kept in herbarium BRA, SAV, and HR. The abbreviations of herbaria are cited in accordance with Index Herbariorum (Thiers 2014).

Taxonomy

Pseudoplectania lignicola Glejdura, V. Kučera, Lizoň, Kunca, **sp. nov.** Figs 1, 2

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Differs from *Pseudoplectania nigrella* by ascospores surrounded by a centrally arranged globose membranous sheath and by elongated cells in the outer ectal excipulum layer forming a palisade perpendicular to the surface.

Type: Slovakia, Nízke Tatry Mts., ca. 3 km N of Hiadeľ village, 48°50′7.38″N 19°18′39.84″E, alt. 700 m, SW exposure, 20° slope, dystric cambisol, biotite granodiorite, in a 100-year old managed forest: *Picea abies* (L.) H. Karst. 77%, *Abies alba* Mill., 17%, *Larix decidua* Mill. 6%; on wood of *Abies alba*, 21.IV.2010, leg. S. Glejdura (**Holotype**, BRA CR-19347).

Etymology: *lignicola* (Latin) = living on wood. Most specimens were collected from wood.

Apothecia at first hemispherical, later cup shaped, plane at full maturity, 1–2.7 cm diam, substipitate or sessile. Hymenium smooth, dark brown to blackish brown. Margin composed of thick-walled cylindrical or slightly clavate hairs 15–110 µm long, 5.5–6.1 µm broad, with 1–3 septa and 1.5–2.3 µm thick walls. Receptacle densely tomentose, covered with thick-walled flexuose, coiled, distantly septate (60–185 µm between septa), black-brown to black hairs, ≤600 µm × 4.6–5.5 µm, walls 0.9–1.5 µm thick.

Ectal excipulum 180–200 µm thick, outermost zone 2–4 cells thick, cells dark brown, thick-walled, subglobose to elongated 20–27 × 14–18 µm, inner layer of subhyaline elongated cells forming a palisade perpendicularly oriented to the surface, cells 34–92 × 15–29 µm.

Medullary excipulum embedded in a gelatinous matrix, outer layer a 180–200 µm thick hyaline textura intricata, cells cylindrical, allantoid, narrowly pyriform 40–60 × 12–22 µm. Inner layer a 500–600 µm thick hyaline densely packed textura intricata, hyphae 9–13 µm diam. Subhymenium 30–40 µm

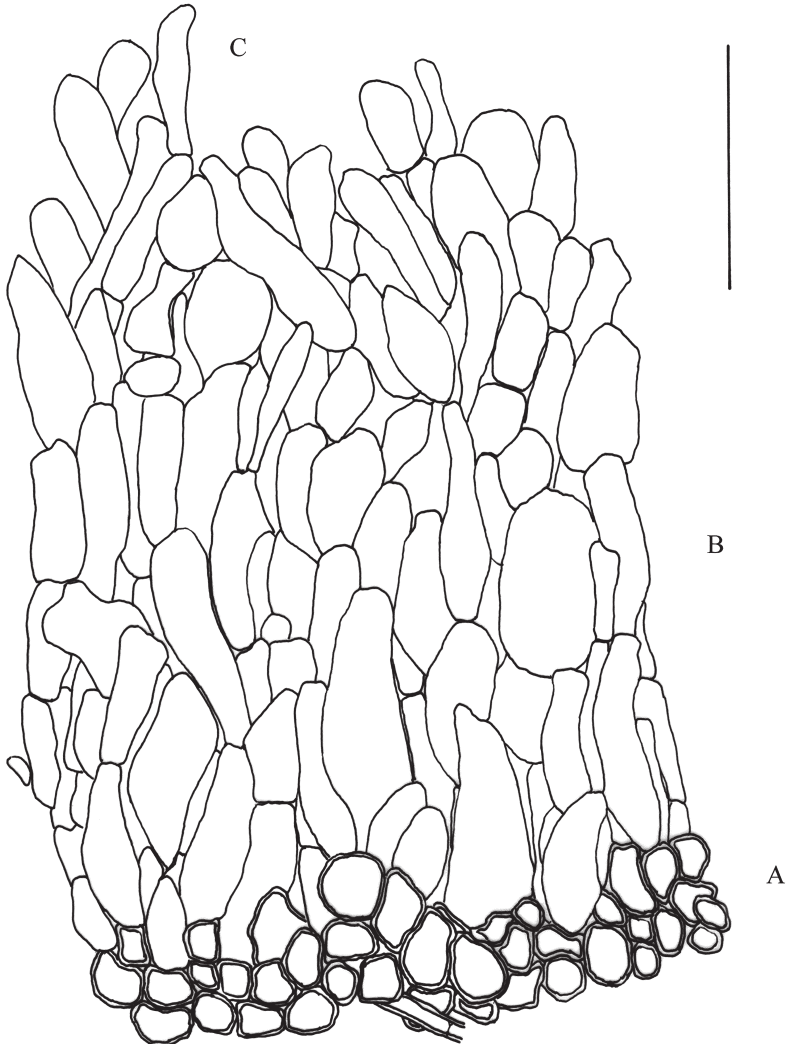

Figure 1. *Pseudoplectania lignicola* (Holotype BRA CR-19347): **A.** Ectal excipulum, outermost thick-walled cells. **B.** Inner layer of the ectal excipulum, elongated cells perpendicularly arranged to the surface. **C.** Distantly arranged cells of medullary excipulum. Scale bar = 50 μm.

thick, composed of light brown densely arranged cylindric, globose and ellipsoid cellular hyphae 3–4.6 μm diam.

Asci narrowly cylindrical, tapered below to thin flexuous aporhynchous base (simple-septate), apex J–, operculate, 8-spored, 259–299 × 12.3–13.7 μm.

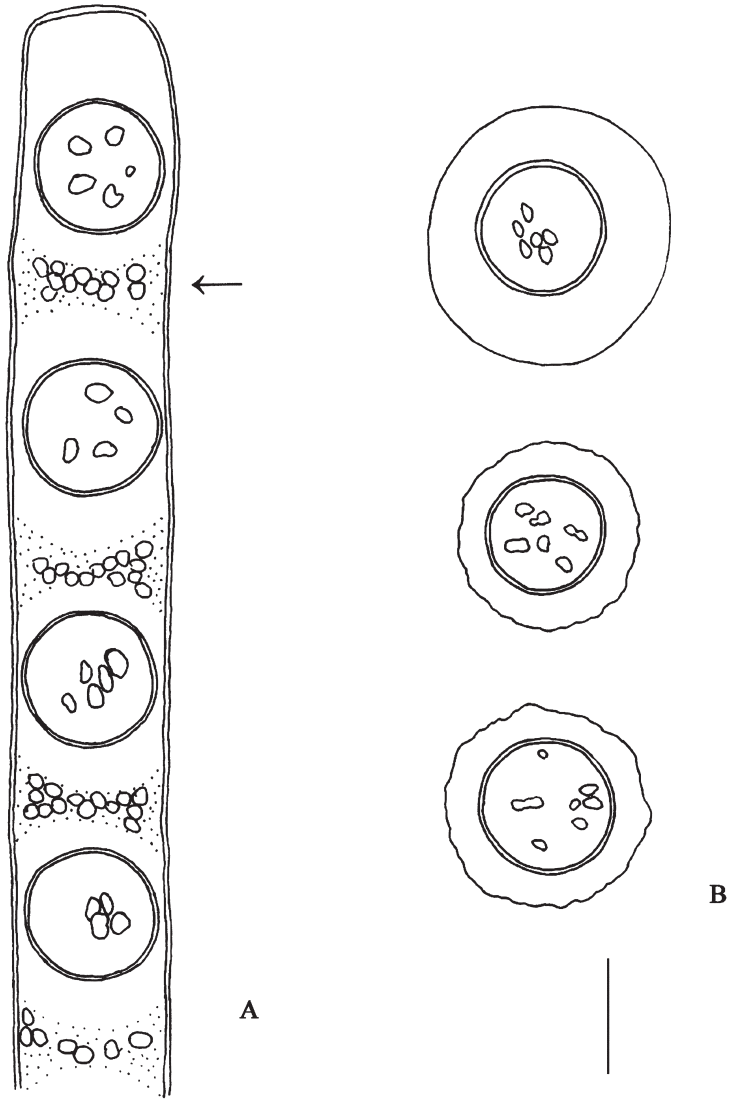

Figure 2. *Pseudoplectania lignicola* (Holotype BRA CR-19347). **A.** Ascus with ascospores from living apothecium; cytoplasmic granules concentrated symmetrically in a limited space by membranaceous sheath (arrowed). **B.** Ascospores with centrally arranged membranaceous sheath, from living apothecium. Scale bar = 10 μm.

Ascospores (mature) globose, thick-walled, with granulate or small guttulate non-oleaginous content (negative reaction in Sudan 4), (10.2–)11–12.2(–12.3)

μm. Mature ascospores surrounded by a membranous cover (sheath) 15.5–19.5 μm (including the sheath). The spores are visible in the center of the sheath in almost all mature ascospores, and in exsiccatae sheath remnants are at least visible on several spores. Ascospores within membranous sheaths are separated by cytoplasmic granules laid crosswise in the ascus. Spore walls usually swollen in 5% KOH, with the membranous sheaths dissolving in the same medium.

Paraphyses cylindric, septate, brownish in the upper part and often agglutinated with an amorphous substance, sometimes branched and anastomosed in basal and medial parts, 2.2–2.8 μm diam, apex mostly straight, often lobed or diverticulate, with lateral proliferations in upper part, enlarged to 2.8–3.6 μm diam. Irregularly cylindrical paraphyses can be observed in young or senescent apothecia. Light brown aseptate paraphyses with slightly thicker walls (so-called hymenial hairs) also present in all stages of apothecial development.

Ecology & Distribution: The species is known from Slovakia and the Czech Republic and possibly also from Norway (Eckblad 1968, see comment below). All available collections come from sub-montane and montane moist coniferous forests (dominated by *Picea abies)* on acid soils.

Additional specimens examined: **SLOVAKIA**, **Nízke Tatry Mts.**, ca. 3 km N of Hiadeľ village, buffer-zone of Nízke Tatry National Park, 48°50′7.38″N 19°18′39.84″E, alt. 700 m, in the forest, SW exposition, 20° slope, sporadically rocky, dystric cambisol, biotite granodiorite, two-storeyed 100-year old production forest, 1st storey: *Picea abies* 77%, *Abies alba* 17%, *Larix decidua* 6%; 2nd storey: *Fagus sylvatica* L. 100%, among moss *Leucobryum glaucum* Schimp., 20.IV.2008, leg. P. Štefanovie (SAV F-10755); on buried wood of *Picea abies*, 23.III.2010, leg. S. Glejdura (SAV F-10756); on wood of *P. abies*, 29.V.2011, leg. S. Glejdura (SAV F-10757); **Veporské vrchy Mts.**, ca. 1 km SW of Sihla village, Nature Reserve Vrchslatina, 48°39′18.96″N 19°37′58.50″E, alt. 900 m, in the forest, flat, 0° slope, dystric histosol (organic soil), diluvial organic sediments (upland moor) on biotite tonalites and granodiorites, three-storeyed ca 65-year old protective forest, 1st storey: *Picea abies* 100%, 2nd, 3rd storey: *Picea abies* 80–90 %, *Alnus incana* Mill. 20–10%, *Sphagno palustris-Piceetum*, well-preserved wetland to peatbog biocenoses with occurrence of specific ecotype of spruce (resonance wood), on buried wood of *P. abies*, 28.V.2010, leg. S. Glejdura & V. Kunca (SAV F-10758); on buried wood of *P. abies*, leg. S. Glejdura & V. Kunca (SAV F-10759); 2.VI.2010 (SAV F-10760); **Vysoké Tatry Mts.**, Tichá dolina valley, ca. 6 km NNE of Podbanské village, National Nature Reserve Tichá dolina, 49°12′1.20″N 19°55′33.24″E, alt. 1140 m, in the forest, NW exposition, 35° slope, typical podzol soil, diluvial sediments on porphyric granitoids and granites, one-storeyed 55-year old protective forest, *Picea abies* 65%, *Sorbus aucuparia* L. 35%, on dead *Sphagnum* sp. and needles of *P. abies*, 18.V.2011, leg. S. Glejdura (SAV F-10761); on buried wood of *Picea abies*, among *Sphagnum* sp. bog, 18.V.2011, leg. S. Glejdura (SAV F-10762); on cone of *Picea abies*, 18.V.2011, leg. S. Glejdura (SAV F-10763).

CZECH REPUBLIC, **Hradec Králové**, Orlická tabule, Chvojnická plošina, 50°10′45″N 15°54′15″E, alt. 260 m, among moss *Leucobryum glaucum* in mixed forest of *Picea abies* and *Pinus sylvestris*, 1.IV.2011, leg. Z. Egertová & M. Sochor (HR 89756).

Discussion

Pseudoplectania is a morphologically and genetically well-delimited genus in the *Sarcosomataceae* Kobayasi (Carbone et al. 2013, 2014). Identification of taxa is based on the paraphysis morphology, ascospore and apothecium size, and substrate preferences. As we have presented in this paper, another character—the shape of the gelatinous (mucilaginous) sheath of the spore—must also be considered an important diagnostic character. Its nature distinguishes similar species: *P. nigrella*, *P. melaena*, and *P. lignicola*. It is easily detected in fresh material, less in dry herbarium specimens, although in the type specimen of *P. lignicola* the gelatinous sheath was still visible as late as three years after collection. Spores of *P. lignicola* lie at the centre of a spherical sheath, whereas in *P. nigrella* spores lie to one side of the surrounding sheath (Figs 2, 3). The hemispherical sheath of spores of *P. melaena* does not surround the spores but lies laterally adjacent to the spore surface (Fig 4), a phenomenon that has not been reported before.

Aside from the spore sheath morphology, *Pseudoplectania nigrella* (Pers.) Fuckel differs from *P. lignicola* by the thickness and textura of the ectal excipulum as well as by habitat and substrate preferences (on soil in coniferous forests, rarely on wooden substrates). Also, the ectal excipulum at the base of its apothecium is thinner (80–100 µm) and composed of smaller cells (17–25 µm diam) having a textura angularis–globulosa. Eckblad (1968: 119, fig. 65d) illustrated a specimen of *P. nigrella* from Norway that has centrally positioned spores in a membranous sheath. We suspect that this could well represent *P. lignicola,* so that our new species may have a wider distribution than currently recorded.

Pseudoplectania melaena (Fr.) Sacc., which has bigger (20–60 mm diam) stipitate apothecia and apically hooked paraphyses, grows on *Abies alba* branches or logs buried in wet soil. *Pseudoplectania sphagnophila* (Pers.) Kreisel, associated with *Sphagnum* sp., has smaller apothecia (10–15 mm diam), and its paraphyses, which may or may not have lateral branches on the upper parts, are apically hooked, as in *Otidea* (Kreisel 1962, Bauer 1999). *Pseudoplectania ericae* Donadini, associated with *Ericaceae* in the Mediterranean area, produces astipitate apothecia ≤10 mm diam. and paraphyses that are 2–3-branched at the apex (Donadini 1987).

Pseudoplectania stygia (Berk. & M.A. Curtis) Sacc. differs mainly by its small (ca 13 mm diam) apothecia and straight cylindrical paraphyses (Carbone 2013), while *P. ryvardenii* Iturr. et al. is distinguished from all other *Pseudoplectania* species by its very small (≤7 mm diam) apothecia and ornamented ascospores. Finally, *P. kumaonensis* Sanwal has distinctly agglutinated paraphyses, and *P. carranzae* (Calonge & M. Mata) M. Carbone et al. is separated from other

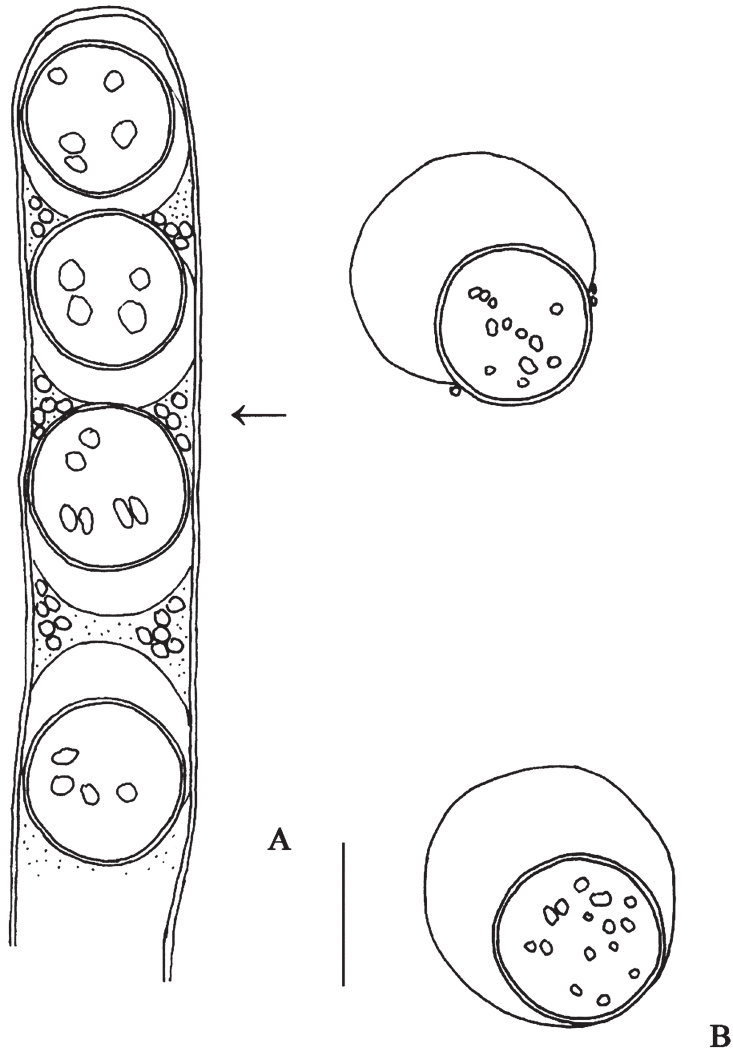

FIGURE 3. *Pseudoplectania nigrella* (SAV F-10764). **A.** Ascus with ascospores from living apothecium; cytoplasmic granules concentrated asymmetrically in a limited space by membranaceous sheath (arrowed). **B.** Ascospores with eccentrically arranged membranaceous sheath, from living apothecium. Scale bar = 10 μm.

members of the genus mainly by the presence of a tomentum or subicular hyphae and smaller asci (170–200 × 10–14 μm; Calonge & Mata 2002).

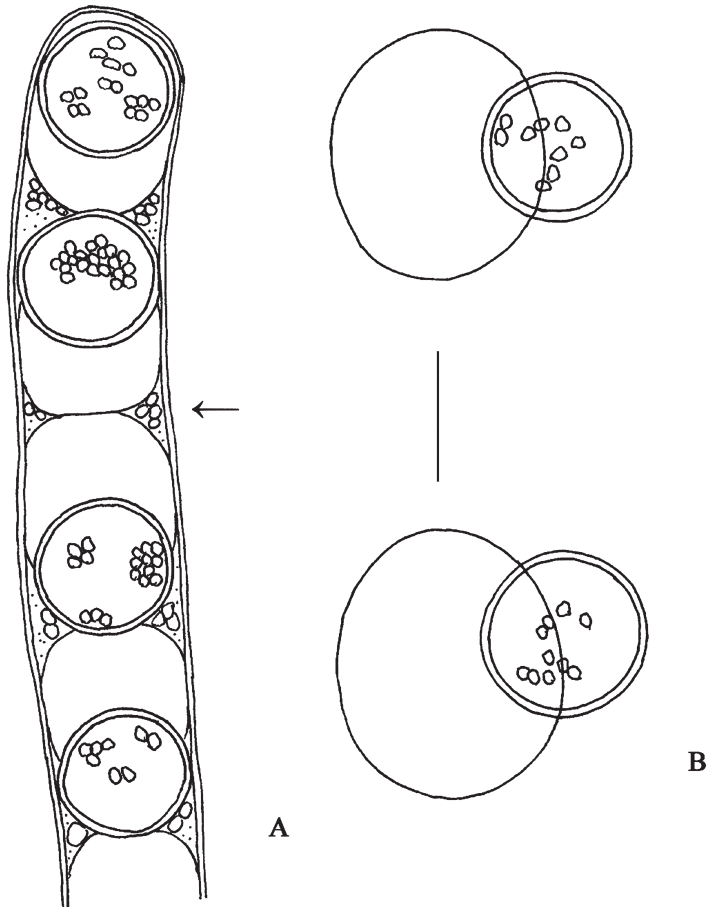

Figure 4. *Pseudoplectania melaena* (SAV F-10516). **A.** Ascus with ascospores from living apothecium; cytoplasmic granules concentrated asymmetrically in a limited space by membranaceous sheath (arrowed). **B.** Ascospores with laterally arranged membranaceous sheath, from living apothecium. Scale bar = 10 μm.

Based on our comparison of paraphysis tips in herbarium material of *Pseudoplectania lignicola*, *P. nigrella*, and *P. sphagnophila* with available literature data, we conclude that paraphysis shape is not helpful for distinguishing species. We observed that paraphyses are generally cylindrical, straight, and unbranched in young apothecia, whereas paraphyses in mature and senescent apothecia are branched, anastomosed, and often curved at the tip.

The nature of the membranous sheath of the spore, however, is unique for each *Pseudoplectania* taxon for which this feature has been observed. The spores of *P. lignicola* lie at the center of this sheath, and its apothecia are ≤27 mm diameter. The new species probably has a wide ecological amplitude, given its growth on *Sphagnum* sp., wood, *Leucobryum glaucum,* and bare soil. *Pseudoplectania* species usually occur on the same site for years (when the conditions allow), and we have registered and collected *P. lignicola* annually from 2009 to 2013.

In Slovakia *P. lignicola* is rare and possibly endangered (due to lodging and biotope changes) and should be included in the next edition of the Red List of Slovak fungi. The fungus has probably been overlooked and incorrectly identified in the past, but its occurrence in suitable habitats is currently not seriously threatened.

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